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A.D. 1899. Feb. 10. No. 3041.

British

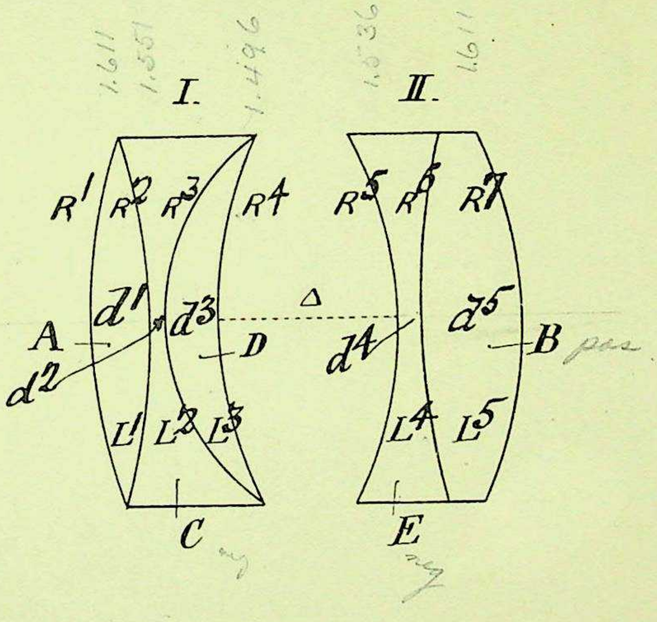
LEITZ'S COMPLETE SPECIFICATION.

(1 SHEET)

Photographic

Lens

2057



$R_1 = 44.3$
R_2 70.7
$R_3 = 17.1$
$R_4 = 45.1$

d_1 7.1
d_2 2.0
d_3 4.8

Focal length $\frac{240}{40}$ /6

359/794.

[This Drawing is a full-size reproduction of the Original.]

Malby & Sons, Photo-Litho.

DW

240/6

33

N° 3041 A.D. 1899

DUPLICATE

Date of Application, 10th Feb., 1899—Accepted, 1st Apr., 1899

COMPLETE SPECIFICATION.

Improvements in Photographic Objectives.

I, Ernst Leitz, of Wetzlar, in the German Empire, Manufacturer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

A double lens has been used, in which the crown glass has stronger refractive power than its attendant flint glass, the crown glass is biconvex and the flint glass biconcave. This double lens enables a high astigmatic correction to be made, and this has been recognized and led to a further form of lens, in which astigmatic sperical and chromatic correction has been so made in each of the triple lenses that either of the latter can be used alone as a photographic objective.

Experiments have shown that the sperical correction was so far behind with regard to the importance of the astigmatic correction that objectives in which the rays falling in an axial plane were brought into conjunction could only be used over about one third of the theoretical opening. This disadvantage in the lighting power of the objective is attributable to the fault of astigmatic correction and a subsequent computation of the rays which do not fall in an axial plane has confirmed this proposition.

The influence of these unaxial rays which increase with the enlargement of the opening of the objective, pointed the way to the construction of an objective in which the number of the astigmatic correction members exceeded that of the sperical correction members.

Such an objective is illustrated in the annexed drawing;—A and B are two biconvex lenses turned respectively towards the object and towards the image. The objective as a whole consists of two unsymmetrical members, of which that marked I towards the object consists of three parts namely a biconvex lens A, a biconcave lens C and a meniscus D. The other member marked II turned towards the image is a dual combination and consists of the biconvex lens B towards the image and the less refractive biconcave lens E.

The two biconvex lenses L^1 L^5 which are more refractive than the following biconcave flint lenses L^2 L^4 give the astigmatic correction. The curve R^3 gives the spherical correction as in the cemented curve of an aplanatic lens. The inner member is a meniscus of crown glass of less refractive than that of the flint glass lens cemented to it.

As this radius is the only means of correction of spherical distortion, neither the triple nor the dual combination can be used alone, but the combination of the two must be looked upon as a single system.

[*Price 8d.*]

As an example of an objective with the above described properties, a system of focal length 240 mm. and an opening of F/8 would have the following measurements

R^1	44·3 mm.	R^5	39·0 mm.
R^2	70·7 ,,	R^6	85·0 ,,
R^3	17·1 ,,	R^7	43·0 ,,
R^4	45·1 ,,	d^4	2·5 ,,
d^1	7·1 ,,	d^5	10·0 ,,
d^2	2·0 ,,	Δ	13·7 ,,
d^3	4·8 ,,		

$L^1 = L^5$	n D	= 1·6112
	n F	1·6187
L^2	n D	1·5514
	n F	1·5587
L^3	n D	1·4967
	n F	1·5020
L^4	n D	1·5366
	n F	1·5444

Having now particularly described and ascertained the nature of this said invention and in what manner the same is to be performed I declare that what I claim is:—

A photographic objective corrected for spherical stigmatic and chromatic errors consisting of two unsymmetrical combinations (I and II) each having on the outside a biconvex lens (A and B) and inside thereof a biconcave lens (C and E) of smaller refractive index, and on the inner side of the combination forming the member (I) nearer the object a meniscus (D).

Dated this 10th day of February 1899.

HERBERT HADDAN & Co.,
18 Buckingham Street, Strand, London, W.C., Agents to Applicant.

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